



Correlational Analysis of IRS Features and Learning Performance in Synchronous Sessions of an Online Course

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Abstract. This paper investigated the relationships between students' perceptions toward the features (i.e., feedback, engagement, usability, and satisfaction) of two instant response systems (IRS) and their learning performance in the synchronous sessions of an online course. A survey was conducted for assessing how IRS features are related to learning performance. Two different IRS tools, "Kahoot" and "mQlicker," were used to conduct meaningful interactive learning activities in the synchronous sessions of an online course. Collected data were analyzed using Pearson Correlation analysis, and it was found that students' feedback, usability and satisfaction are significantly correlated to learning performance. On the other hand, engagement did not show any significant correlation to learning performance. Discussion and implications of adopting IRS tools are also presented.

Keywords: Instant response system (IRS); Feedback; Engagement; Usability; Learning satisfaction; Learning performance.

1 Introduction

Instant response systems (IRS) are becoming increasingly popular for better receiving students' feedback, both in physical and online classrooms. Besides, the value of IRS in the pedagogical sector has gained increasing attention as a way of enhancing learning [1]. There could be numerous reasons for educators to use an IRS tool in the classroom. For example, it can be used for providing immediate feedback [2] about a particular topic of interest, creating a cumulative record of participation [2], enabling widespread anonymous participation [3], enhancing engagement among students, teachers [4] and content [3]. Chien, Chang, and Chang [3] mentioned that engaging students in explaining and justifying their answers to IRS questions is highly recommended because such an instructional strategy is associated with positive and strong effect sizes for academic learning outcomes. Therefore,

teachers are mainly focused on the term “instant responses” when implementing IRS-integrated instruction in their courses. Due to its learner-friendly interface, an IRS has a comparative advantages over conventional learning systems with the similar cognitive aspects of learning practices [5]. For example, Oigara and Keengwe [4] found that the superior effect of IRS-integrated instruction, compared to conventional lectures. In another study, Dong, Hwang, Shadiev, and Chen [6] found that introverted students are quiet, less active, and tend to be withdrawn from others [7]. As commonly known that extroverts and introverts correspond to active and reflective students; Dong et al. [6] found that students with introverted characteristics like to participate in IRS-based courses. Some research focuses on the relationship between IRS use and student learning that examines the relationship between IRS use and student learning performance in traditional classrooms. There is a lack of research on exploring the relationship between students’ perceived IRS features and learning performance in synchronous sessions of an online course. The aim of this study was to fill this gap by analyzing the relation between different IRS features, including feedback, engagement, satisfaction, and usability, and students’ learning performance in synchronous sessions of an online course. Two popular IRS tools “Kahoot” and “mQlicker” were chosen to conduct IRS-based instructions in the experiment. The research questions are stated as follows:

1. What are the relationships between students’ perceived IRS features and learning performance in the synchronous sessions of an online course.

2 Literature review

2.1 Pedagogical applications of IRS tool features and learning performance

A number of recent works have identified that the perceived IRS tool features (i.e., feedback, engagement, usability, learning satisfaction) are important factors for effective learning (1). Hunsu, Adesope, and Bayly [8] found that IRS questions improved memory of material two days later compared to no-IRS controls, provided that immediate feedback was given for each question. Thus, instant feedback is one of the major features of IRS that is defined “as the degree to which teachers providing instant responses with visual representation improves the students’ understanding of the content, sharing of opinions, etc.” [9]. Engagement is another important IRS factors which is determined by the interactions between the environment and the individual, so that social and academic changes in class modify students’ perceptions and engagement [10]. This study defined engagement as the perception of the student that results from his/her relationship with teachers, peers, and learning activities with IRS tools during the learning experience, and which generates involvement with the topic studied [9]. A perceived usability factor was defined by Shackel and Richardson [10] as “the capability in human functional terms to be used easily and effectively by the specified range of users, given specified training and user support, to fulfill the specified range of tasks, within the specified range of environmental scenarios.” In this

study, usability refers to an IRS tool which can be used easily and effectively by the distributed participants with existing skills, to fulfill the specific range of tasks [9]. Oliver [11] stated that “satisfaction is the consumer’s fulfillment responses. It is a judgement that a product/service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption related fulfillment, including levels of under- or over-fulfillment” (p. 8). In this study, we define satisfaction as the students’ responses as a judgement of the IRS features, their usage that provides a pleasurable level of learning-related fulfillment, including levels of under- or over-fulfillment [9]. Both students and faculty have reported that the experience of using IRSs in the classroom is very positive and leads to increased classroom satisfaction [12].

3 The tool features of Kahoot and mQlicker and learning task designs

There are six reasons to use Kahoot as an IRS tool, namely it is flexible, simple to use, diverse, engaging, global, and free to use. People choose Kahoot according to the demands of their profession. Kahoot provides four key features of quiz, survey, discussion, and Jumble. Surveys can be used to find out what participants already know (or have just learned without competition). The discussion feature is provided to get educators through building the questions and hosting them quickly. Kahoot allows 95 characters for questions and 60 characters for answers, and also allows users to add media supports such as images, videos, PPT, etc. Moreover, another tool, mQlicker, can also be used as an IRS tool. There are many reasons to use mQlicker: it provides WYSIWYG editing of interactions and questions dragging and dropping between most parts of the administrative user interface, powerful search features, and a question bank for easy re-use. Moreover, mQlicker provides templating support, previews while editing questions in interactions and a user-defined folder structure for organizing data.

4 Methods

4.1 Participants, instruments and procedure

The participants were master’s students of a university in Taiwan. A total of 26 students aged 23 to 28 years old participated in this study. A 10-item questionnaire was developed to survey the students’ perceptions about the different IRS features in assisting their learning as shown in the Table1. Each item was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The experiment was conducted over a period of eight online synchronous sessions, with a total of 400 minutes. The procedure of this study consisted of three steps. In the first step, participants were given brief instructions on how to log into Kahoot and mQlicker and on how to participate in the learning activity sessions. In the second step, each participant was asked to participate the designed learning activities using different IRS features for eight sessions. The third step was to fill the questionnaire for approximately 15 minutes.

Table 1. Descriptive statistics and factor loading

Description of items	Mean	Stdv	FL
Feedback (Standardized Cronbach's $\alpha=.680$)			
F1: The instant feedback (i.e., the results provided by IRS based on all inputs from students) and visual representation of summarized results was helpful for my understanding of the content	4.55	.751	.945
F2: The instant feedback (i.e., the results provided by IRS based on all inputs from students) was useful for me to clarify my misconception even when I made mistakes	4.40	.843	.895
F3: I acquired some new knowledge from the analyzed results of instant feedback provided by IRS based on all input from students	4.44	.891	.694
Engagement (Standardized Cronbach's $\alpha=.55$)			
E1: The use of IRS in this course helped me engage more in classroom learning	4.40	.690	.853
E2: I actively participated in the learning activities facilitated by IRS	4.40	.600	.853
Usability (Standardized Cronbach's $\alpha=.775$)			
U1: . IRS is a user-friendly IRS tool	4.33	.919	.794
U2: I found IRS in this course easy to use	4.03	.979	.855
U3: It would be easy for me to become good at using IRS in the classroom	4.48	.642	.700
U4: IRS provided excellent visualization of the result	4.44	.751	.782
Satisfaction (Standardized Cronbach's $\alpha=.864$)			
S1: I am satisfied with using Kahoot as a learning/instructing assisted tool.	4.14	.863	.902
S2: I felt comfortable asking questions during class about material I did not understand.	4.25	.764	.842
S3: I found the use of Kahoot in the course to be fun.	4.40	.693	.815
S4: I'm satisfied with the accuracy and the quality of the output.	4.48	.642	.762

5 Results and discussions

5.1 The relationship between students' perceived IRS features and learning performance in the synchronous sessions of an online course.

A Pearson correlation analysis was used, with the measure of the relationship between students' perceived IRS features and learning performance in the synchronous sessions of an online course. The result of the Pearson correlation analysis is presented in Table 2

Table 2. Correlation between perceived IRS features and learning performance (N=26)

	Perceived IRS feedback	Perceived IRS usability	Perceived IRS satisfaction	Perceived IRS engagement	Learning performance
Perceived IRS feed back	1	—			.572**
Perceived IRS usability		1	—		.537**
Perceived IRS satisfaction			1	—	.447**
Perceived IRS engagement				1	.212

**Correlation is significant at the .01 level (2-tailed)

It was found that the relationship between perceived IRS feedback, usability and satisfaction features and learning performance was significant, $p < .05$. The results show that perceived IRS feedback, usability and satisfaction features were respectively significantly correlated with learning performance ($r = .572$, $p = .002$; $r = .537$, $p = .004$; $r = .447$, $p = .019$). More specifically, the higher the feedback, usability and satisfaction, the better the learning performance. While some studies have found that IRS use in the classroom correlates with higher test scores, other studies found no such effect [13]. Students might apply IRS during their assigned individual/group PowerPoint presentation. For example, after presenting some slides, students might add one to two questions to ask the audience. Thus, it might enhance peer discussions as well as catching students' attention. Thus, the presenter/group might take challenge for their own task. Experienced IRS teachers might discuss the usefulness of IRS with their colleagues. The results also found that the relationship between perceived IRS engagement feature and learning performance was not significant, $p > .05$. The results show that perceived IRS engagement feature was not significantly correlated with learning performance ($r = .212$, $p = .288$). The finding of this study is very different from that of the study of Quaye and Harper [14], which found that student "engagement" is considered the best predictor of student learning and academic success. The reason might be that students are using many social media such as Facebook, Twitter, WeChat, Skype, etc. Such social media have many features that students use, which help them to be engaged seamlessly at any time. Thus, students are more likely to engage in social media rather than in IRS for learning.

6 CONCLUSIONS

This study explored the relationship between the IRS tool features and learning performance for students participating IRS-based learning activities in synchronous sessions of an online course. The results of this study indicate that the IRS tool features play a significant role in relation to the students' learning performance. It was found that feedback, usability and satisfaction were strongly correlated to learning performance. Moreover, the relationship between engagement and learning performance was not significant in this study. Future studies should consider adequate strategies for supporting teachers in designing effective IRS-based learning activities. For example, both formal and informal feedback from the students are important in order to enhance learning satisfaction, and more engagement may enhance students' expected feedback.

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